

**BY ORDER OF THE
SECRETARY OF THE AIR FORCE**



AIR FORCE INSTRUCTION 21-113

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Maintenance

**AIR FORCE METROLOGY AND
CALIBRATION (AFMETCAL)
MANAGEMENT**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFPD 21-1, *Air and Space Maintenance*, relative to United States Air Force Metrology and Calibration (AFMETCAL) management requirements. It applies to all military and civilian AF personnel and calibration activities who design, develop, acquire, use, operate, maintain, or manage test, measurement, and diagnostic equipment (TMDE), including Air National Guard (ANG) units and Air Force Reserve. Refer recommended changes and questions about this publication to the office of primary responsibility (OPR) using the AF FORM 847, *Recommendation for Change of Publication*. Route AF Form 847s from the field through the appropriate functional chain of command. Supplements to this publication must be sent to the OPR for coordination prior to publication. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS) located at <https://www.my.af.mil/gcss-af61a/afirms/afirms/>.

SUMMARY OF CHANGES

This interim change deletes the requirement for AFMETCAL to assess PMELs and corrects language for centrally-procured TMDE funded by the working capital fund. A margin bar indicates newly revised material.

1. Requirements. The AFMETCAL Program is a hierarchical system of calibration laboratories, personnel, equipment, and procedures to ensure systems and equipment

measurements are safe, accurate, uniform, reliable and traceable to either the National Institute of Standards and Technology (NIST) or AFMETCAL-approved sources. All TMDE used to make or verify meaningful (quantifiable) measurements shall be calibrated.

1.1. Air Force Materiel Command (AFMC) is designated as the executive agent for establishment, oversight, processes, and procedures for AFMETCAL. AFMC shall appoint an AFMETCAL Director, who will also function as the Product Group Manager (PGM) for Air Force calibration standards and systems.

1.2. The AFMETCAL Director/PGM shall:

1.2.1. Plan, program, and budget for:

1.2.1.1. Precision Measurement Equipment Laboratory (PMEL) and Air Force Primary Standards Laboratory (AFPSL) calibration standards/systems acquisition.

1.2.1.2. AFMETCAL Research and Development requirements to develop adequate National and Air Force calibration standards.

1.2.1.3. Calibration and maintenance services provided through the AFPSL, or centrally funded as designated in published AF calibration determinations contained in Technical Order (TO) 33-K-1-100-1, *Calibration Procedure for Maintenance Data Collection Codes and Calibration Measurement Summaries*, TO 33-K-1-100-2, *TMDE Calibration Interval Technical Order and Work Unit Code Reference Guide*, and/or applicable Calibration and Measurement Summaries (CMSs).

1.2.1.4. Development and maintenance of AF Calibration Technical Orders (33K Series).

1.2.1.5. Development and maintenance of AFMETCAL automated calibration procedures used by PMELs to calibrate TMDE.

1.2.2. Review MAJCOM (or equivalent) requests to establish or close PMELs and forward a recommendation on the request to AF/A4L for a decision.

1.2.3. Provide cradle-to-grave management of Air Force calibration standards and systems, which include:

1.2.3.1. PMEL Base Measurement Standards and equipment for field-level PMELs cataloged in the Air Force Equipment Management System (AFEMS) Allowance Source Code (ASC) 734.

1.2.3.2. AFMETCAL PGM developed PMEL calibration systems cataloged in various ASCs.

1.2.3.3. Air Force measurement standards and equipment for the AFPSL.

1.2.4. Manage operation and maintenance of the AFPSL.

1.2.5. Be the AF technical authority on metrology issues and the single point of contact for calibration services and traceability of measurements to NIST.

1.2.6. Represent the Air Force to the Joint Technical Coordination Group for Calibration and Measurement Technology (JTCCG-CMT) and provide support to sub-group activities.

1.2.7. Provide metrology technical and engineering support to MAJCOMs (or equivalent) to resolve metrology problems and/or improve calibration techniques. Coordinate with MAJCOM (or equivalent) Functional Managers to:

1.2.7.1. Establish calibration facility requirements/standards for PMELs.

1.2.7.2. Identify home station and deployed requirements for new and replacement calibration standards, considering equipment for effectiveness and productivity improvement.

1.2.7.3. Identify metrology training requirements.

1.2.7.4. Identify applicable ASC entries to the ASC manager.

1.2.7.5. Redistribute excess PMEL calibration standards.

1.2.7.6. Evaluate TMDE calibration software developed by PMELs for potential Air Force wide use.

1.2.8. Coordinate annual equipment buys with the support equipment PGM.

1.2.9. Develop and publish an AFMETCAL master plan to program and budget for AFPSL and PMEL calibration standards/systems acquisitions.

1.2.10. Serve as the AF metrology focal point for countries participating in the Security Assistance Program. Coordinate the use of PMEL services to support security assistance activities. Support Air Force Security Assistance Programs for metrology and calibration requirements as stipulated in Government to Government agreements.

1.2.11. Develop, publish and maintain TO 00-20-14, *AF Metrology and Calibration Program*, in coordination with MAJCOM (or equivalent) PMEL functional managers.

1.2.12. Develop, publish and maintain AF Calibration Technical Orders (33K Series) and coordinate their validation and verification.

1.2.13. Develop metrology support concepts and acquire/provide calibration equipment to support Automatic Test Equipment (ATE) and Systems (ATS) in coordination with System Program Managers (SPMs), Program Managers (PMs), and the support equipment PGM.

1.2.14. Make calibration responsibility determinations, establish initial calibration intervals, and adjust calibration intervals for TMDE and publish in TO 33K-1-100-1/2 or Air Force CMSs.

1.2.15. Be the AF approval authority for requests to obtain calibration services from a commercial or other non-AF laboratory.

1.2.16. Certify USAF calibration entities, including contractors operating AF-owned calibration laboratories.

1.2.17. Void or withhold a calibration laboratory's certification for such reasons as inability to show traceability to NIST, lack of technical capability required to calibrate customer TMDE, failure to provide adequate facilities and controlled environment for those facilities, or failure to satisfy AFMETCAL certification criteria contained in TO 00-20-14.

- 1.2.17.1. In extreme cases, support may be discontinued for base measurement standards after coordination with the owning MAJCOM (or equivalent) functional manager.
- 1.2.18. Recommend action, including closure, for laboratories unable to achieve certification to AF/A4M and the owning MAJCOM (or equivalent).
- 1.2.19. Collaborate with all product centers, sustainment centers, test centers and Air Force Research Laboratory (AFRL) to identify new or increased measurement capabilities.
- 1.2.20. Collaborate with the Missile Defense Agency (MDA) to identify metrology needs and manage development of National and DOD measurement standards and calibration services.
- 1.2.21. Interface with SPMs, PMs, PGMs, Air Force support contractors, MAJCOM (or equivalent), and other DOD agencies to:
 - 1.2.21.1. Evaluate and report deficiencies and recommend changes to weapon system and equipment calibration support concepts throughout their life cycle.
 - 1.2.21.2. Provide AFMETCAL data requirements for weapon system and equipment acquisition data calls, and centrally-procured TMDE funded by the working capital fund data calls.
 - 1.2.21.3. Evaluate and make approval recommendations for contractor prepared Calibration Measurement Requirement Summary (CMRS) data, Support Equipment Requirements Document (SERD) or equivalent document relative to calibration and measurement traceability requirements.
 - 1.2.21.4. Participate in SPM, PM and PGM system/product life cycle planning and technical interchanges.
 - 1.2.21.5. Provide metrology-related Government Furnished Equipment (GFE), when available, to Air Force contractors as required for calibration support development.
- 1.2.22. Chair AFMETCAL Advisory Group meeting, as required, and be responsible for its charter.
 - 1.2.22.1. Chair a PMEL Management Information System (MIS) Configuration Control Board (CCB), when required, and co-chair, as necessary, with the AFMC PMEL functional manager, an Air Force Metrology and Calibration (AFMETCAL) Material Group Product Improvement Working Group (PIWG) in conjunction with AFMETCAL Advisory Group meetings.
- 1.2.23. Provide guidance, in conjunction with the PMEL MIS CCB, to the Maintenance Information Technology Program Management Office for the development and maintenance of a PMEL MIS.
- 1.2.24. Collaborate with AF/A4/7 and MAJCOMs (or equivalent) to identify PMEL management information system requirements.
- 1.3. Acquisition of systems and equipment shall include assessment of calibration and measurement requirements. For additional information see MIL-HDBK-1839, *Department*

of Defense Handbook Calibration and Measurement Requirements. Acquisitions requiring a CMRS shall comply with MILSTD-1839, *Calibration and Measurement Requirements*.

1.4. PMELs shall be established at selected installations to serve as the single base-level AFMETCAL focal point.

1.5. Activities planning to establish or close a PMEL shall request approval by submitting a written request through their parent MAJCOM (or equivalent) to AF/A4L with a parallel courtesy copy to the AFMETCAL Director.

2. Responsibilities:

2.1. Deputy Chief of Staff , Logistics, Installations and Mission Support (AF/A4/7):

2.1.1. Advocate for AFMETCAL requirements.

2.1.2. Authorize the establishment or closure of AF calibration laboratories. Prior to authorizing, solicit input from the AFMETCAL Director on impact establishment/closure would have on AF calibration support capabilities, processes, and/or costs.

2.1.3. Acquire, modify and sustain the PMEL Automated Management System software.

2.2. Commander, Air Force Materiel Command (AFMC/CC), provides the AFMETCAL Director with resources and operation support.

2.3. MAJCOMs (or equivalent):

2.3.1. Operate and maintain certified PMELs IAW TO 00-20-14 to provide calibration and maintenance support for TMDE operated by users within their area of responsibility.

2.3.2. Support the AFMETCAL Director as requested by providing a member for the AFMETCAL Advisory Group, PMEL MIS CCB, and AFMETCAL Material Group PIWG.

2.3.3. Appoint a PMEL Functional Manager to coordinate implementation of the AFMETCAL requirements.

2.3.4. Ensure users/owners of AF TMDE comply with the requirements detailed in TO 00-20-14 and have TMDE calibrated IAW published calibration schedules, TO 33K-1-100-1/2, and appropriate CMSs.

2.4. SPMs/PMs/PGMs:

2.4.1. Integrate metrology, calibration and alignment requirements in system and equipment acquisition planning processes, statements of work, and requests for proposal.

2.4.2. Include AFMETCAL Director in system and equipment sustainment planning, support equipment integrated product development, CMRS development, and technical interchanges. Identify metrology-related GFE/CFE requirements to the AFMETCAL Director.

2.4.3. Include AFMETCAL Director on system and equipment acquisition data calls, and funded by the working capital fund centrally procured TMDE data calls.

2.4.4. Coordinate with AFMETCAL Director during system and equipment design reviews.

2.4.5. Coordinate requirements for contracted calibration services through the AFMETCAL Director (including Interim Contract Support, Contract Logistics Support or when managing SE as spares when acting as the Inventory Control Point).

2.4.6. Include MIL-STD-1839, *Calibration and Measurement Requirements*, for new systems and equipment acquisitions that require a CMRS.

3. Prescribed Forms:

None

4. Adopted Forms:

AF FORM 847, *Recommendation for Change of Publication*

LOREN M. RENO, Lieutenant General, USAF
DCS/Logistics, Installations and Mission Support

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFPD 21-1, *Air and Space Maintenance*, 25 Feb 2003

AFMAN 23-110, *CD Basic USAF Supply Manual*, 1 Apr 2009

AFMAN 33-363, *Management of Records*, 1 Mar 2008

AFI 33-150, *Management of Communications Activities*, 26 Nov 2008

AFI 25-201, *Support Agreements Procedures*, 1 May 2005

AFI 63-101, *Acquisition and Sustainment Life Cycle Management*, 17 Apr 2009

MIL-HDBK-1839A, *Department of Defense Handbook Calibration and Measurement Requirements*, 27 November 2000

MIL-STD-1839D, *Calibration and Measurement Requirements*, 12 May 2010

TO 00-20-14, *Air Force Metrology and Calibration Program*, 30 June 2009

TO 33K-1-100-1, *Calibration Procedure for Maintenance Data Collection Codes and Calibration Measurement Summaries*, 30 November 2010

TO 33K-1-100-2, *TMDE Calibration Interval, Technical Order and Work Unit Code Reference Guide*, 1 January 2011

Abbreviations and Acronyms

AF—Air Force

AFMC—Air Force Materiel Command

AFMETCAL—Air Force Metrology and Calibration

AFPSL—Air Force Primary Standards Laboratory

ANG—Air National Guard

AS—Allowance Standard

ASC—Allowance Source Code

ATE—Automatic Test Equipment

ATS—Automatic Test Systems

CFE—Contractor Furnished Equipment

CMRS—Calibration and Measurement Requirements Summary

CMS—Calibration and Measurement Summary

DOD—Department Of Defense

DRU—Direct Reporting Unit

FOA—Field Operating Agency

GFE—Government Furnished Equipment

IAW—In Accordance With

JTCG-CMT—Joint Technical Coordinating Group (for) Calibration and Measurement Technology

MAJCOM—Major Command

MDA—Missile Defense Agency

MIL—Military

NIST—National Institute of Standards and Technology

PGM—Product Group Manager

PM—Program Manager

PMEL—Precision Measurement Equipment Laboratory

SERD—Support Equipment Recommendation Data

SPM—System Program Manager

STD—Standard

TMDE—Test, Measurement, and Diagnostic Equipment

TO—Technical Order

USAF—United States Air Force

Terms

Air Force Metrology and Calibration (AFMETCAL)—Refers to measurement standards and TMDE, professional and technical metrologists, performing work centers, a system of worldwide laboratory facilities, TMDE users, calibration data, and integrated planning. The program provides for maintenance and calibration of TMDE to verify the reliability and ensure the accuracy of systems, subsystems, and equipment.

Air Force Primary Standards Laboratory (AFPSL)—The highest level calibration standards laboratory in the AFMETCAL Program. It maintains Air Force measurement standards certified by the NIST or other nationally recognized standards. The AFPSL (located at Heath, Ohio) uses these measurement standards to calibrate base level or PMEL measurement standards and equipment for Air Force customers.

Alignment—The physical, electrical, or software action that enables a calibration technician to adjust TMDE so that performance will be within required operational parameters/accuracies.

Calibration—A comparison between equipment items, one of which is a measurement standard of known accuracy, to detect, correlate, adjust and report any variations in the accuracy of the other item.

Calibration and Measurement Requirement Summary (CMRS)—A three-category, in-line summary of measurement parameters. A CMRS identifies all measurement requirements within a specific system or item of equipment. The CMRS further displays the contractors' proposed

solutions for maintaining the system measurement requirements within the stated limits. It is also used to identify the need for new calibration standards.

Calibration and Measurement Summary (CMS)—A technical order which identifies calibration support necessary to ensure the operational readiness of a specific weapon system, subsystem or mission. The summary describes the calibration concept and is the calibration authority for the applicable weapon system, weapon subsystem or mission.

Certification—The documented designation that standards and TMDE have been calibrated and meet established technical requirements. When used to refer to a calibration laboratory (PMEL or AFPSL), certification means the laboratory fulfills AFMETCAL assessment criteria.

MAJCOM (or equivalent)—This term refers to all Air Force Major Commands (MAJCOMs) and includes the Air National Guard (ANG), Field Operating Agencies (FOAs), and Direct Reporting Units (DRUs).

Metrology—The science or system of weights and measures used to determine conformance to technical requirements. This includes the development of standards and systems for absolute and relative measurements.

Precision Measurement Equipment Laboratory (PMEL)—A laboratory authorized to own and use Air Force base measurement standards to maintain working standards. The working standards are used along with PMEL-owned TMDE to maintain (troubleshoot, align, repair, and calibrate) TMDE designated as PMEL responsibility.

Support Equipment Recommendation Data (SERD)—A contractual data item submitted by the contractor to identify weapon system support equipment requirements.

Test, Measurement, and Diagnostic Equipment (TMDE)—Those devices used to maintain, evaluate, measure, calibrate, test, inspect, diagnose, or otherwise examine materials, supplies, equipment, and systems to identify or isolate actual or potential malfunctions, or decide if they meet operational specifications established in technical documents.

Traceability—The ability to relate individual measurement results to national standards or nationally accepted measurement systems through an unbroken chain of comparisons all having stated uncertainties.

Types of Standards Used in Measurement and Testing—The term "standard" means equipment or physical constants serving as the basic means by which we derive accurate and traceable precision measurements. These standards include:

a. National Measurement Standards—Equipment or physical constants identified by NIST to serve as a basic measurement reference throughout the United States.

b. Air Force Measurement Standards—Equipment certified by NIST or AFMETCAL-approved sources, and used by the AFPSL as a basic measurement reference for the US Air Force.

c. Air Force Base Measurement Standards—Equipment certified by the AFPSL or AFMETCAL-approved sources for use by an Air Force PMEL as a measurement reference.

d. Calibration Systems—A collection of calibration standards and ancillary equipment uniquely configured to support a specific workload or multiple measurement parameters. (Calibration Systems may be developed for use in either an automated or manual mode.

AFMETCAL retains engineering and configuration authority for Calibration Systems identified with an AFMETCAL cage code.)

e. Working Standards—PMEL-certified TMDE used to calibrate other TMDE.